MULTIMEDIA UNIVERSITY ™

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID: 2215)

PTM0145 – TRIGONOMETRY

(Foundation in Information Technology)

20 FEBRUARY 2023
9:00 a.m. – 11:00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS:

1. This exam paper consists of 5 **pages** (including cover page) with 5 Questions only.

2. Attempt all the questions. All questions carry equal marks and the distribution of marks for each question is given.

3. Please write all your answers in the Answer Booklet provided. Show all relevant steps to obtain maximum marks.

Question 1 [10 marks]

(a) Find (i) A + B and (ii) A – B. Given that matrices of

$$A=\begin{bmatrix}1 & -5 & -1\\ 7 & 6 & 5\\ 2 & -3 & 2\end{bmatrix} \text{ and } B=\begin{bmatrix}2 & 3 & -3\\ 0 & -4 & -4\\ -3 & 5 & -1\end{bmatrix}$$

[2 marks]

(b) Solve the following systems of linear equations by using matrix (Inverse matrix or Cramer's Rule).

$$\begin{aligned} x-2y+z&=3\\ x+y&=4\\ x-2y+4z&=2 \end{aligned}$$

[8 marks]

Question 2 [10 marks]

(a) Determine whether the two lines are parallel, perpendicular, or neither:

$8y-4x=7$ and $2y=x+6$. [4 marks]

(b) Find the equation of the following circles in standard form and determine the center and radius of the following circles:

$$x^2+y^2+10x-6y=1$$

[6 marks]

Question 3 [10 marks]

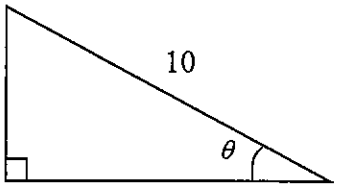
(a) Let $z = 3 + 4i$ and $w = 2 - 3i$, perform $z \cdot w$ and $\frac{z}{w}$. Write the result in the standard form $a+bi$. [6 marks]

(b) Let $z=-2+4i$. Find the polar form of z. [4 marks]

Continued...

Question 4 [10 marks]

(a) Find the exact values of the six trigonometry functions of the acute angle θ of the following triangle.



[6 marks]

(b) Solve the equation, $2\cos^2\theta - 3\cos\theta + 1 = 0$ on the interval $[0, 2\pi)$. [4 marks]

Question 5 [10 marks]

(a) Given that point C is the center of the unit circle shown in Figure 1, $a = b = 1$ and $\alpha = \beta$. If A, B and D are points on the circle,

(i) find the value of θ (angle of ACD) from point $A = \left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$. [2 marks]

(ii) find the values of γ, α and β. [2 marks]

(iii) determine the value of c. [2 marks]

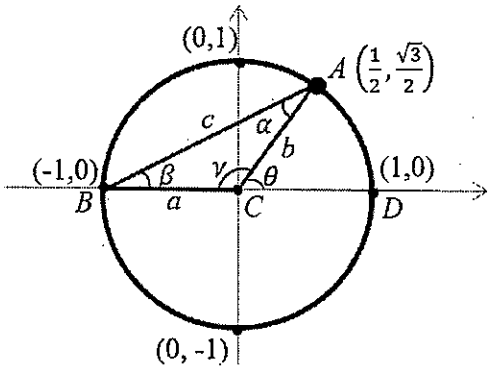


Figure 1

(b) Verify the identity,

(i) $\cos x - \cos^3 x = \cos x \sin^2 x$ [2 marks]

(ii) $(\sin x + \cos x)^2 = 1 + 2\sin x \cos x$ [2 marks]

Continued...

APPENDIX

Quotient Identities

$\tan x = \dfrac{\sin x}{\cos x}$ $\cot x = \dfrac{\cos x}{\sin x}$

Reciprocal Identities

$\csc x = \dfrac{1}{\sin x}$ $\sec x = \dfrac{1}{\cos x}$ $\cot x = \dfrac{\cos x}{\sin x}$

Pythagorean Identities

$\cos^2 x + \sin^2 x = 1$ $\tan^2 x + 1 = \sec^2 x$ $\cot^2 x + 1 = \csc^2 x$

Cofunction Identities

$\sin\left(\dfrac{\pi}{2} - \theta\right) = \cos\theta$ $\cos\left(\dfrac{\pi}{2} - \theta\right) = \sin\theta$

$\tan\left(\dfrac{\pi}{2} - \theta\right) = \cot\theta$ $\cot\left(\dfrac{\pi}{2} - \theta\right) = \tan\theta$

$\sec\left(\dfrac{\pi}{2} - \theta\right) = \csc\theta$ $\csc\left(\dfrac{\pi}{2} - \theta\right) = \sec\theta$

Even/Odd Identities

$\sin(-\theta) = -\sin(\theta)$ $\cos(-\theta) = \cos(\theta)$ $\tan(-\theta) = -\tan(\theta)$

$\csc(-\theta) = -\csc(\theta)$ $\sec(-\theta) = \sec(\theta)$ $\cot(-\theta) = -\cot(\theta)$

Sum/Difference Formula

$\cos(A + B) = \cos A \cos B - \sin A \sin B$

$\cos(A - B) = \cos A \cos B + \sin A \sin B$

$\sin(A + B) = \sin A \cos B + \cos A \sin B$

$\sin(A - B) = \sin A \cos B - \cos A \sin B$

$\tan(\alpha + \beta) = \dfrac{\tan\alpha + \tan\beta}{1 - \tan\alpha \tan\beta}$ $\tan(\alpha - \beta) = \dfrac{\tan\alpha - \tan\beta}{1 + \tan\alpha \tan\beta}$

Product-to-Sum Formulas:

$\sin x \cos y = \dfrac{1}{2}\left(\sin(x - y) + \sin(x + y)\right)$

$\sin x \sin y = \dfrac{1}{2}\left((\cos(x - y) - \cos(x + y)\right)$

$\cos x \cos y = \dfrac{1}{2}\left(\cos(x - y) + \cos(x + y)\right)$

Continued...

Sum to Product Formulas:

$$\sin x + \sin y = 2\left(\sin\left(\tfrac{x+y}{2}\right)\cos\left(\tfrac{x-y}{2}\right)\right)$$
$$\sin x - \sin y = 2\left(\cos\left(\tfrac{x+y}{2}\right)\sin\left(\tfrac{x-y}{2}\right)\right)$$
$$\cos x + \cos y = 2\left(\cos\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right)\right)$$
$$\cos x - \cos y = -2\left(\sin\left(\frac{x+y}{2}\right)\sin\left(\frac{x-y}{2}\right)\right)$$

Some widely used ratios:

$$\sin 60^\circ = \frac{\sqrt{3}}{2} \qquad \cos 60^\circ = \frac{1}{2} \qquad \tan 60^\circ = \sqrt{3}$$
$$\sin 30^\circ = \frac{1}{2} \qquad \cos 30^\circ = \frac{\sqrt{3}}{2} \qquad \tan 30^\circ = \frac{1}{\sqrt{3}}$$
$$\sin 45^\circ = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2} \qquad \cos 45^\circ = \frac{1}{\sqrt{2}} \qquad \tan 45^\circ = 1$$

Law of Sines

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Law of Cosines

$$c^2 = a^2 + b^2 - 2ab\cos C$$
$$b^2 = a^2 + c^2 - 2ac\cos B$$
$$a^2 = b^2 + c^2 - 2bc\cos A$$

End of paper.